Translation of German Patent Document No. 4,100,400
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Priority Date: N/A
Int. Class: G03 B 10/02
Application Date: January 9, 1991
Publication Date: July 16, 1992
Original German Title: Spiegelreflexkamera

MIRROR REFLEX CAMERA

The invention relates to a mirror reflex camera having an exchangeable back-plate mounted to the camera housing.

In addition to numerous electronic still video cameras which are provided with a CCD surface sensor as camera element, some commercially available mirror reflex cameras allow to employ a still video back plate in place of the conventional camera back plate, which was developed for this camera and is provided with a CCD surface sensor.

Although electronic still video cameras equipped with CCD surface sensors can be used like a photographic camera, the resolution capability is significantly less than in known electronic cameras in which the optical image is scanned in the focal plane by a moving CCD-line sensor. These types of CCD-line sensors allow for very high resolution images to be taken.

However, due to the long time required for scanning, only still subjects can be photographed. These types of cameras are commercially available; they are usually equipped with a stand and a copy carrier surface, and are used to "read" documents.

A publication by the Gesellschaft für Strahlen- und Umweltforschung, m.b.H., München (Company for Radiation and Environmental Research) describes an electronic camera for imaging three-dimensional objects. The camera is referred to as "high-resolution CCD-Line-Sensor Camera" in which a CCD-line sensor is also moved over the image plane.

German patent application 39 23 521 also teaches an electronic camera having CCD-line sensor for line-by-line imaging of large surface specimen, with the camera being equipped with a light device which is provided with optical elements for forming a light beam on the specimen. The light device is pivotably mounted. The CCD-line sensor is movable as a function of the pivoting movement of the light device in the vertical direction within the image plane of the camera lens so that the light beam that is directed over the specimen can be imaged on the CCD-line sensor.

All of the electronic cameras equipped with a CCD-line sensor are separate and very large costly cameras.

It is the object of the present invention to provide a device which delivers electronic images which provide high quality images, and which can be used in combination with conventional mirror reflex cameras.

The problem under consideration is solved in that for scanning an image in the image plane of the camera, a back plate with a translationally movable CCD-line sensor is connected to the camera housing.

An advantageous embodiment comprises a frame, which is resiliently mounted to the back plate and accommodates the movable CCD-line sensor arranged on the back plate. This frame can be pressed against the surfaces of two film guide rails when the back plate is closed.

More particularly, the invention provides that the frame supports a movable device for the CCD-line sensor, which is configured in such a way and mounted to the frame that the CCD-line sensor lies in the image plane when the frame is pressed against the film guide rails.

An embodiment of the invention is described in greater detail below and illustrated in the drawing in which:

Fig. 1 is a side-view of the subject matter of the invention; and

Fig. 2 is the view from below of the subject of the invention illustrated in Fig. 1.

A replaceable back plate 10 for a mirror reflex camera (not illustrated) and equipped with a CCD-line sensor 20 as an accessory device. The sensor is displaceable by a translational movement. Of the camera housing in Fig. 1, only the surface 24 of two film guide rails is indicated by the dash/dotted lines; and in Fig. 2 the image aperture 25 limiting the image field is indicated.

Reference numeral 13 designates the entire frame, which is resiliently mounted to the inside of the back plate 10. The frame is provided with two parallel extending longitudinal webs 13a which extend above the film guide rails 24. the webs are provided with two slightly protecting contact surfaces 13d. The longitudinal webs 13a are connected transverse webs 13b and 13c, which are angled in the direction of the back plate 10. The webs are fastened to the springs 12 which project from the back plate to which they are riveted.

A motor 16, with a spindle 17, which is flanged to a motor shaft, is fastened to a transverse web 13b. The free end of the spindle is rotatably mounted on the opposite transverse web 13c. Two guide belts 19 are additionally provided with one being on the right side of the spindle 17 and the other on the left side of the spindle and both are also mounted and fastened to the transverse webs 13b and 13c.

On the spindle, a block-shaped carriage 18 is arranged transversely to the image plane. The carriage is slidably mounted on the two guide bolts 19 and is provided with a projection 18a, which faces the image plane. This projection extends between the two longitudinal webs 13a of the frame 13 and ends at the back plate 10 that is placed on the camera and directly in the region above the image plane. A CCD-line sensor 20 is arranged at the end surface 18b of the projection 18a.

When the line sensor device is assembled, the four contact surfaces 13d of the frame 13 are aligned in such a way with the surface of the CCD-line sensor 20 that all surfaces together lie in one plane. Precise positioning of the sensor surface in the image plane on the side of the camera is accomplished by the resilient pressure of the frame 13 with its four surfaces 24 to the film guide rails on the side of the camera.

An electronic CCD-line camera cannot receive a displayable image until the scanning process is completed, typically, approximately after 30 seconds. This makes focusing very difficult after the electronic image is taken. This leads to the conclusion that an optical aid to focus and define the image frame is very helpful. Owing to the precise positioning of the sensor surface in the image plane, the reflex finder or autofocus on the camera is also effective for a line-scannable electronic image.

Since the exposure time for a line-scanned electronic image is a fixed multiple of the exposure time required by the film, the exposure metering system of the camera can also be used for the electronic image. Slight differences in the spectral distribution of the light sensitivity of the camera exposure meter and the CCD-line sensor are negligible in this case.

One problem is that the measured value of the camera exposure meter must be transmitted to the scanning electronics without the camera providing the installed signals for this purpose.

In a first embodiment, the scanning device is provided with an adjustment lever, slider, wheel or the like on the back which projects from the back plate 10 and which adjusts a common sensitivity, for example, 200 ASA, that would be required for the selected aperture. Conventional photo exposure meters to the determine the exposure time are suitable for this purpose. The set exposure time is not directly realized by the sensor electronics, instead, it is converted internally into sensor-appropriate time values.

In the embodiment illustrated in Figs. 1 and 2, the scanning device is additionally provided with a photodiode 21 at the end surface 18 of the projection 18a, which supports the CCD-line sensor 20. This photodiode lies also in the region of the image plane and can measure opening times of

the shutter. However, in cameras with so-called automatic timers (the aperture is pre-selected) operation without the transmission of numerical values is not possible without manual levers. Even in the automatic mode of the camera, a sample shutter release is performed for the purpose of adjusting the shutter of the camera to the correct time (for example, for 200 ASA). The photodiode measures this shutter speed and signals the measured value to the scanning electronics. The camera is subsequently set manually to an unlimited long-term exposure (B or T). Then the electronic image is taken. The CCD-line sensor 20 is displaced in a translational movement over the image field by the motor-operated displacement device as the distribution of light in the image plane is being scanned.

The signals transmitted by the scanning electronics are digitalized in the accessory device, and they are transmitted by means of a suitable interface, for example, to a personal computer.

In addition to the afore-described embodiments, namely, to set the exposure time manually, or to transmit the exposure time via a photodiode in the camera to the scanning electronics, there is another option: to use the CCD-line itself as exposure meter. In this case, the image is scanned at a much lower resolution and therefore at a significantly lower scanning time, for example, 1 to 10 settings of the carriage 18 carrying the CCD-line

sensor, in which case, in each carriage position, 10 to 1,000 pixels are evaluated, for example. From the 10 to 1,000 signals obtained in this manner, one or more characteristic values, for example, maximum, minimum, and median value, are determined, and based on these and a fixed program, or after choosing between different exposure modalities, such as "avoid overexposure" of a portion of an image, "prevent underexposure" of a portion of an image or "exposure based on median value," the scanning time for the final electronic image is determined. The camera is always operated with an open shutter, with the exposure always being precisely determinable through spectral distribution of light sensitivity while the exposure is being measured and while the photo is taken.

CLAIMS

1. Photographic mirror reflex camera, including a camera back plate which is arranged on the camera housing, characterized in that in order to scan an image in the image plane of the camera, a back plate with a translationally movable CCD-line sensor is connected to the camera housing.

2. Photographic mirror reflex camera as defined in Claim 1, characterized in that, a frame, which is resiliently mounted to the back plate

(10) and accommodates the movable CCD-line sensor (20), is arranged on the back wall (10), wherein said frame can be pressed against the surfaces (24) of two film guide rails when the back plate is closed.

3. Photographic mirror reflex camera as defined in Claims 1 and 2, characterized in that the frame (13) is provided with a movement device (16, 17, 18, 19) for the CCD-line sensor (20), said movement device being arranged within the frame (13) in such a way that the CCD-line sensor (20) lies in the image plane if the frame (13) is pressed against the film guide rails.

4. Photographic mirror reflex camera as defined in Claims 2 and 3, characterized in that the frame (13) is provided with two longitudinal webs (13a) which extend parallel above the film guide rails and are provided with contact surfaces (13d).

5. Photographic mirror reflex camera as defined in Claim 2 to 4, characterized in that the longitudinal webs (13a) are connected with two transverse webs (13b, 13c) which are angled toward the back plate.

6. Photographic mirror reflex camera as defined in one or more of Claims 1 to 5, characterized in that the transverse webs (13b, 13c) are fastened to leaf springs which project from the back plate (10), and in that in the middle of a transverse web (13b) a motor and a spindle (17) which is

associated with a motor shaft are fastened, with the free end of said spindle being rotatably mounted on the opposite transverse web (13c).

7. Photographic mirror reflex camera as defined in one or more of Claims 1 to 6, characterized in that a guide bolt (19) is arranged on each side of the spindle (17) and in that both guide bolts (19) are mounted and fastened in the transverse webs (13b, 13c).

8. Photographic mirror reflex camera as defined in one or more of Claims 1 to 7, characterized in that a block shaped carriage (18) is arranged on the spindle (17), said spindle extending transverse to the image plane and slidably mounted on both sides of the guide bolt (19).

9. Photographic mirror reflex camera as defined in one or more of Claims 1 to 8, characterized in that a projection (18a), which faces the image plane and is arranged between the longitudinal webs (13a), said projection ends in the region of the image plane the end surface (18b) of which supports the CCD-line sensor (20).

10. Photographic mirror reflex camera as defined in one or more of Claims 1 to 9, characterized in that on the back plate (10) an adjustment lever, slider, wheel or the like is provided to adjust and set an exposure time that was determined by an exposure meter in the sensor electronic.

11. Photographic mirror reflex camera as defined in one or more of Claims 1 to 9, characterized in that in order to input a measured value in the scanning electronics to measure an exposure time, a photodiode (21) is arranged on the end surface (18b) of the carriage (18) which carries the CCD-line sensor (2).

US Patent and Trademark Office
Translations Branch
Martha Witebsky - August 15, 2003

Nummer: DE 41 00 400 A1
Int. Cl.[5]: G 03 B 19/02
Offenlegungstag: 16. Juli 1992

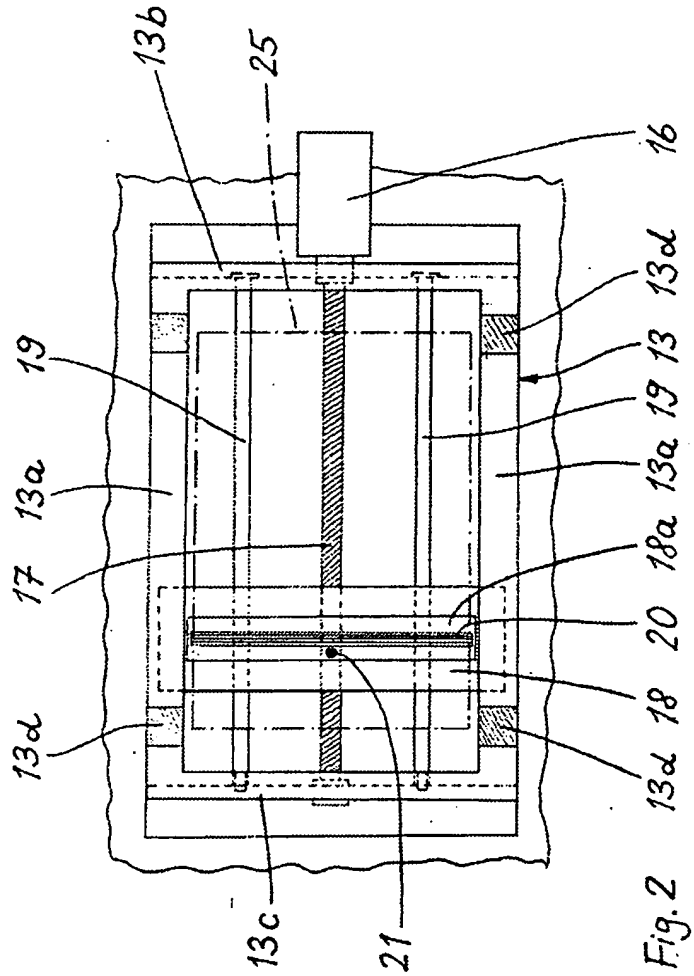

Fig. 2

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